

SCIENCE.

FRIDAY, DECEMBER 3, 1886.

COMMENT AND CRITICISM.

THIS IS THE SEASON of governmental reports, and we are forcibly reminded by them of the intricate and complex administrative system that has been developed in the United States. Most of these reports are of real interest to the community, but all save the most important of them are never read. Yet some of the reports by minor officers contain a great deal of valuable information, and merit notice. One such is the report of the adjutant-general of the army, who touches on the condition of the militia of the various states. Inasmuch as our regular army is too small to merit the name, and since we must depend on our volunteer forces in case of war, the topic is of some importance. The adjutant-general approves of state encampments as a means of drilling and training the militia, but, soldier-like, criticises the prevailing tendency to make an encampment a sort of picnic for the state officials. To be of any real benefit, General Drum says that state encampments should be of ten days' duration, and established at a sufficient distance from the homes of the members of the command to overcome the social and business influences which otherwise interfere with military duties. The camp must be divested of any holiday appearance, and the time devoted to instruction and practice in skirmish and battalion drills, and guard duty, target-practice, etc.; for, says General Drum, "as most of the fighting of the future must be done in open order, a thorough acquaintance with the skirmish drill is of the highest importance." He also disapproves of mere exhibition drills, and favors arming the state troops with the best and newest arms and ammunition.

The superintendent of the naval academy, Commodore Sampson, devotes the major portion of his report to an argument in favor of shortening the present six years' course of study at that institution. He desires to have the fifth and sixth years of the course, now devoted to service on cruising vessels, done away with, and the cadets commissioned at the end of the fourth year, instead of, as

now, at the end of the sixth, on the ground that the country gains no additional advantage from the last two years. Commodore Sampson also shows that under the existing system, which restricts each congressional district to a candidate every six years, one-third of the boys are never eligible for admission to the academy, because of the various restrictions as to age; whereas, if the course were reduced from six years to four, each congressional district would have an appointment once in four years, and all the boys of the country would be eligible at some time. At the last annual examination, 163 candidates reported; but only 86 fulfilled the requirements, and were entered as cadets.

But of the reports thus far made public, with the possible exception of the treasury statements, that of the postmaster-general will attract most attention. Using statistics gathered in 1884—since which time our postal service has grown immensely—by the international bureau of the Universal postal union, Mr. Vilas shows that our postal machinery far exceeds that of any other nation on the globe. It is estimated that last year one hundred million more letters were mailed here than in Great Britain,—long the leading letter-writing nation,—and nearly that number more than were mailed in Germany, France, and Austria combined. Of pieces of matter mailed, the annual proportion per inhabitant is 19 in Germany, 57 in Great Britain, and 66 in the United States. At the close of the last fiscal year there were in this country 53,614 post-offices, and 497 stations or branch-offices: of this number, only 2,265 are so-called presidential offices. It is a curious and suggestive fact, that, of the new offices established during the year, over sixty per cent were located in fourteen southern states and Indian Territory. During the year the carriers handled 1,949,520,599 pieces of mail matter, an increase over the previous year of 11.75 per cent. About four millions of dollars were transferred on postal orders, and 1,118,820 special delivery stamps were used. The gross revenue for the year amounts to \$43,936,000, leaving a deficiency of nearly \$7,000,000 to be provided for by appropriation.

FIGURES ARE SOMETIMES STRANGE things, but no less convincing than strange. They frequently force a man to assent to a proposition against his will, and in opposition to what he has persuaded himself is true. The latest case in point, and the one we have in mind, is a contribution of the *London Economist* to the discussion on bad times and depression. Great Britain has been commiserating itself on its unprosperous financial condition, and John Bull has loudly asseverated that he is losing money. In the face of this comes the *Economist* with the statement, that, instead of having grown poorer, Great Britain has, during the last decade, saved and invested at least one thousand million pounds sterling, a sum one-third greater than the national debt. This immense sum is believed to be far within the truth, since it takes no account of the large sums annually spent in improvements, nor of the very considerable sum sent out of the country to secure foreign and colonial investments. The *Economist* proves its assertion by showing that within ten years the country has invested the following sums: house property, £400,000,000; home railways, £186,000,000; joint stock companies, £200,000,000; colonial loans, £80,000,000; loans to English local authorities, £72,000,000, — in all, £938,000,000. The *Spectator*, in noticing this fact, thinks that it is not so much, after all; for it is only a saving of "a hundred million pounds sterling a year, or a fifth more than is paid in national taxation, — probably not two shillings in the pound of national income, and certainly not a fourth of the income of those who pay the income tax." This may be so; but practically it may make considerable difference in the expenditures of a people, to find, that, instead of annually running behind, they are really getting ahead each twelvemonth. But be these figures what they may, it seems to be an undoubted fact that a large section of the British population feel that they grow poorer year by year; and, until we can determine more precisely what weight attaches to the statistics prepared by the *Economist*, we are unwilling to say emphatically that such feeling is without any justification in fact.

FEW ORGANIZED CHARITIES are so uniformly successful and so richly deserving as the Children's aid society of New York City, of which Mr. Charles L. Brace is the efficient and judicious executive officer. In describing the work of the society at the annual meeting of the trustees, Mr.

Brace detailed the principles of the society and the results attained by proceeding upon them. The principles were defined as the absolute necessity of treating each youthful criminal or outcast as an individual, and not as one of a crowd; the immense superiority of the home or family over any institution in reformatory and educational influence; the prevention of crime and pauperism by early efforts with children, and the vital importance of breaking up inherited pauperism by putting almshouse children in separate homes; and, most of all, the immense advantage of 'placing out' neglected and orphan children in farmers' families. The records of the city police courts show how these principles work in practice. While in thirty years the city's population has increased from about six hundred and thirty thousand to nearly a million and a half, the number of girls committed for petty larceny has fallen in the same period from over nine hundred to less than two hundred and fifty. In the same time the commitments of female vagrants have decreased from 5,778 to 2,565.

The industrial schools, employing over one hundred teachers, and giving instruction to ten thousand pupils, are the most important branch of the society's work. Mr. Brace claims that "the industrial schools act especially in preventing the growth of a race of drunkards, as the children become elevated above the habit. The enormous decrease of some fifty per cent in cases of drunkenness known to the police during the past ten years is one proof of this. The remarkable decrease of some twelve and a half per cent in all crimes against person and property during the past ten years, as well as the decrease from previous years, is one of the most striking evidences ever offered of the effects of such labors as those of this society and of many similar charities. It has gone on regularly in years both of business depression and prosperity. It proves that such labors are diminishing the supply of thieves, burglars, drunkards, vagrants, and rogues." Another original and useful branch of the society is its lodging-houses, which combine the various functions of school, workshop, emigration agency, and lodging-house. Each child pays for his support by labor or money. The liberal benefactions of Miss Wolfe, J. J. Astor, and Mrs. R. L. Stewart, who have each put up large buildings for these purposes, have greatly aided the society. There

are now six lodging-houses, and they have sheltered during the year over 11,000 children at an average cost per capita of \$47.65.

A SIGNIFICANT ILLUSTRATION of the interest taken by Russians in anthropological research and the zeal and activity of Russian scientific bodies is furnished by the annual report of the Society of lovers of natural science anthropology and ethnology, read at its annual meeting in Moscow on the 27th ult. In the course of the past year the society has held fifty meetings, at which there were read one hundred and thirty papers and reports; it has organized and sent into the field seventeen scientific expeditions, including one to the Black Sea, one to the valley of the Ob in western Siberia, and one to the Caucasus; it has made valuable collections in all parts of the empire; and, finally, it has published eight volumes of memoirs embodying the scientific work of its members. Six medals of gold and six of silver were awarded at the annual meeting to members of the society who had especially distinguished themselves during the year in scientific research.

OPINIONS SEEM TO DIFFER as to the dangers connected with the use of cocaine. Dr. William A. Hammond does not believe that there is any danger of a person becoming so addicted to its use that he cannot discontinue it at any time. Dr. J. B. Mattison, on the other hand, looks upon it as a drug which already has entangled within its coils a number of persons, who are as unable to stop its use as if the drug were opium instead of cocaine, and for whose relief a proper course of treatment is necessary. The statistics thus far seem to indicate that physicians and apothecaries are especially prone to its unrestricted use, as, up to the present time, they form the larger part of its victims.

THE DISCOVERY of petroleum in Scotland, as mentioned in the *Glasgow herald*, is interesting in connection with the discoveries made many years ago of petroleum in small quantity in English coal-measures; but it is very probable that this locality, like those in England, will not yield oil in commercial quantity. It is worth while, however, to call attention to the fact that the distillation of oil from 'bog-head' coal and the Midlothian shales, with which this new pit is probably connected, led eventually to the production of petroleum in the United States.

THE *Lancet* records the case of a young girl who had attacks exactly resembling delirium tremens from the effect of tea-leaves which she was in the habit of chewing. We have already called attention to the many and varied disorders which may occur as the result of the excessive use of strong tea, and have no doubt that many persons suffering from dyspepsia and palpitation of the heart would find these symptoms to disappear, or at least be markedly diminished, if they would discontinue the excessive use of tea as a beverage.

IN COMMENTING UPON the extraordinary efficiency claimed for the Marchant steam-engine, which has been attracting considerable attention in England of late, *Science* of Oct. 29 intimated that in the tests made there might possibly have been some source of error, which would be revealed by further trials under more satisfactory conditions. Conclusive tests recently made in the presence of representatives of *Engineering*, the *Electrical review*, and other technical journals, prove that the amount of coal consumed for each horse-power per hour, as shown by the brake, was four pounds, instead of eight-tenths of a pound, as shown at previous trials.

MEASLES APPEARS TO BE very prevalent in New York City. For the week ending Nov. 20, there were 253 cases reported, of which 38 were fatal. During the first two years of the war of the rebellion there were 38,021 cases of this disease in the army, of which 1,864, or about 1 in 31, were fatal. Bartholow regards this as an underestimate. He thinks, that, if all the complications and sequels were taken into account, the mortality would be at least 1 to 5. The number of deaths in Brooklyn for the same period was but 4. It is difficult to estimate the probable number of cases of this disease in either city, the mortality varying so much at different times, and for reasons which are not ascertainable, although it is doubtless true that only a very small proportion of the cases are reported to the health authorities in any of our cities. While New York is nearly free from small-pox, and has been for a long time, — but one case in many months, — Brooklyn appears to have the disease to a considerable extent, some forty or more cases having been reported within the past month. With so much of this disease in a neighboring city, it will be very strange if New York continues to be exempt.

MUSCLE-READING BY MR. BISHOP.

MR. W. I. BISHOP, a young American, who has given a number of exhibitions of muscle-reading in Europe and this country, gave a private performance recently in Boston. As considerable discussion has ensued in the daily press as to what the exhibitor did or did not do, and as the newspaper reports have been misleading, we present a brief account of the actual performances at Boston.

The principal feats were four in number: 1. The discovery of a knife hidden in an adjoining room, and the re-enactment of a pretended murder with the knife; 2. Writing on a blackboard the number of a bank-note; 3. Finding an object hidden at a distance from the hotel; 4. Playing a piece of music on the piano. While doing these feats, Mr. Bishop was blindfolded, and ascertained what he was to do through unconscious communications from a person who knew exactly what was to be done. There is no reason to doubt the fairness of the conditions, or to suspect collusion.

1. In the watched absence of Mr. Bishop, the Rev. James Freeman Clarke took a knife and pretended to stab Dr. C. C. Everett; he then, accompanied by Dr. Minot J. Savage, hid the knife. The performer returned and was blindfolded; he then placed Dr. Clarke's hand upon his own, and essayed unsuccessfully to find the knife. At the performer's request, Dr. Savage took hold of Dr. Clarke's wrist of the same hand Mr. Bishop was touching. With this double guidance, Mr. Bishop went quickly to the place where the knife was hid, found it, returned, stopped in front of Dr. Everett, and copied with his own hand but imperfectly the stabbing done by Dr. Clarke. During the whole time his hand was close to or actually touching Dr. Clarke's.

2. Dr. William James looked at the number on a bank-bill which comprised three digits unknown to Mr. Bishop. The latter drew some large squares upon a blackboard, one for each digit. He was again blindfolded, and, taking Dr. James's hand in his, stood in front of the board, and, while his guide fixed his attention upon the squares and the digits, he drew the three digits in succession correctly.

3. An open carriage seating four persons, with two quiet horses, was brought to the door of the Hotel Vendome, where the exhibition was given. A party of three gentlemen, all well known, had previously hid a scarf-pin in a private house a few blocks off. The three gentlemen, accompanied by Mr. Bishop, who was blindfolded and had a black hood over his head, got into the carriage. Each of the four had hold of the long piece of

wire which Mr. Bishop had provided. Two of the gentlemen placed their hands upon Mr. Bishop's head. Mr. Bishop drove off, and, after a few false turns, came to the right house, got out there, and accompanied by his guides, and touched by at least one of them, found the pin, and then returned to the hotel. Two circumstances probably facilitated this performance. First, when the party returned, one of them touched Mr. Bishop, who was blindfolded; and the latter, while his guide was looking at the large map of Boston hanging on the wall, and thinking of the house where the pin was, put his own finger upon the right spot on the map. Mr. Bishop may have thus gained some general knowledge as to where the locality was. Second, the street on which he started runs east and west; there was a bright afternoon sun; it is probable that the light was sufficient to inform him at least as to the points of the compass. However, these sources of information, though helpful, were insufficient to show exactly where the pin was hid.

4. Mr. Bishop asked Mr. Whitney to think of some well-known melody, and suggested something from 'Il Trovatore.' Mr. Whitney adopted the suggestion, and informed the audience of his selection. Mr. Bishop placed himself in front of the piano, and, touching Mr. Whitney's hand, proceeded to strike the right notes on the keyboard. His guide's attention was concentrated on the melody, and on the movements of Mr. Bishop's hand over the keys.

Several other feats were attempted, but failed. The failures were presumably due to the guides not being good subjects.

According to the unanimous opinion of the most competent judges, the explanation of the feats accomplished is simple and obvious, and has already been given as regards Mr. Bishop personally by Professor Preyer. If the descriptions given above are recalled, it will be noticed, 1°, that nothing was done except when there was contact between the performer and the guide; and, 2°, that success required nothing but the execution of some movement on Mr. Bishop's part. Thus, in the first feat he had to go to a certain place, take a knife, return with it and strike a blow; in the second, to make certain marks upon a blackboard; in the third, to move, in part by the guided power of horses, to a certain place, and there move his hand to a particular spot and take hold of an object; in the fourth, merely to strike certain piano-keys. In spite, therefore, of the apparent diversity of things done, there was no real variety, and there is only one thing to explain. It is this: how did Mr. Bishop ascertain what movements or motions he was to execute?

That we have no reason to suspect trickery has already been said. We must also seek some means of communication of which the guides were unconscious. Mr. Bishop claims that he received his impressions by direct mind-reading, or, as it is now often called, telepathy; and a certain number of persons appeared inclined to accept that explanation. But when Mr. Bishop's arguments are examined, they vanish: and in his replies in the newspapers to his critics he has insidiously and assiduously avoided discussion of any of the real objections to his assertion that his feats are done by genuine mind-reading; so that we are compelled to think that his real purpose is to make his exhibitions assume a marvellous character in the mind of the public, or else that he really believes in his assertion, which, may we be pardoned for saying frankly, implies a notable ignorance of physiology and psychology,—a degree of ignorance not rare in itself, though rarely coupled with so much audacity of opinion.

The only explanation which we can consider tenable is the simple one of muscle-reading, already advanced by Professor Preyer. As already stated, Mr. Bishop was in every case in contact with his guide, and his feat was to make the motion which the guide knew he ought to make. In accordance with Preyer's view, we think that slight pressures of the guide's hand were exerted, that these were perceived by Mr. Bishop, and sufficed for his guidance. That the explanation is ample is apparently not questioned by any of those who have followed the recent discussions upon muscle-reading. It is now very properly held by, we believe, all qualified judges, that, when there is contact between the performer and the guide, there is no adequate reason to assume the occurrence of true mind-reading. Mr. Bishop, however, thinks the contrary, and says the impressions on his mind are telepathic, and not sensory, in origin. By a common mental flaw, Mr. Bishop, at least in our judgment, assumes a remote and improbable cause, instead of a near and probable one. To our mind it would be a like reasoning which said that love exerts a powerful attraction: stones are not drawn toward the earth by gravity, but by the love they have for the earth.

We may conclude by saying that we consider Mr. Bishop an exceptionally good muscle-reader, and regret that the mysteries with which he seeks to envelop his exhibitions give an effect of charlatanism, entirely distasteful to an honorable lover of scientific truth. We have therefore expressed ourselves more unreservedly than would have been fitting in the discussion of a subject concerning which an honest divergence of opinion were possible among scientific men.

A SUBMARINE VOYAGE.

THE submarine torpedo-boat shown in the accompanying illustration has made frequent trial trips, during the past few months, in the Hudson River, off the foot of 80th Street, this city; and the degree of success attained has been highly gratifying to her owners, the Submarine monitor company. A brief description and illustration of the boat were given in *Science* of Aug. 27, but several changes have been made in details of her construction and equipment since that date, so that she now presents a somewhat different appearance. A pair of horizontal rudders has been attached at the bow, so that the boat may be submerged 'on an even keel,' that is, in a horizontal position, instead of at an angle, as formerly. The boat can be submerged by means of the rudders only when she is in rapid motion, rising immediately to the surface if the engine stops, or if the rudders are changed from an inclined position, as in the engraving, to a horizontal position. When not in motion, the boat may be submerged or raised to the surface by taking in or forcing out water-ballast.

A fin, or vertical projection, has been attached to the upper part of the boat, amidships, extending 'fore and aft,' so as to guard the manhole and conning-dome or pilot-house from collision with the keel of a ship when passing under its bottom. A depression in the fin, between the manhole and the dome, is intended to afford a sort of resting or holding place for the boat when under a ship's keel while releasing torpedoes. A pair of sleeves or gloves of india-rubber project from the boat abaft the dome, one of which is shown in the picture. By inserting his arm in one of these sleeves, the captain of the boat can release the torpedoes at the proper moment, the torpedoes being attached by tripping devices to the outside of the boat.

The proposed method of using the boat in actual warfare is as follows: she will be submerged by means of the rudders or water-ballast, or both. When at the proper depth, she will approach the vessel to be destroyed, and, as she passes beneath it, two torpedoes will be released, each attached to one end of a rope. The torpedoes will be lightened by cork or an equivalent, so that they will rest against the bottom of the vessel, one on each side of the keel. The boat will then be run ahead a safe distance, and the torpedoes exploded by electricity through wires leading from the boat. There has been no torpedo practice yet with the Peacemaker, as the new boat is called, but the intention of her owners is to make some experiments in that direction soon.

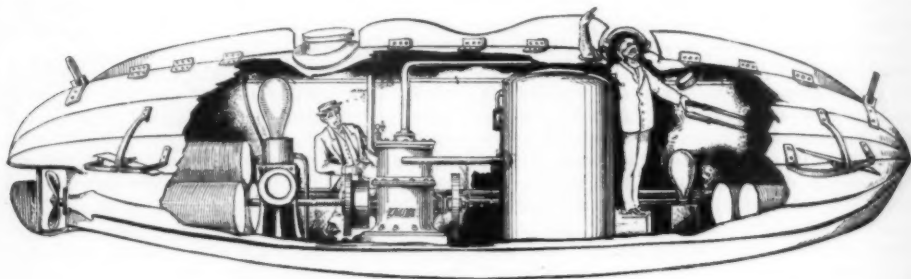
In the illustration the side of the boat is broken

away to show the interior. In the bow are two cylindrical water-tanks, above which are two steering-levers, within easy reaching distance of the captain. There is also a small steam-pump for filling or emptying the tanks. The captain stands with his eyes on a level with the glazed apertures in the conning-dome, whence he has a view all around the horizon while above the surface. When submerged, he shapes his course by a compass. Near the middle of the boat is the steam-boiler, abaft of which is the engine. In the stern are three cylindrical water-tanks similar to those in the bow, and for the same purpose. A large steam-pump stands just forward of the tanks. Several compressed-air pipes, each six inches in diameter, extend along the sides of the boat, near the bottom.

When the boat was first built, electricity was tried as a motive power. The storage-batteries and electric motor, being found inadequate, were

into the solution, by which it is absorbed, the process developing heat, which produces more steam in the boiler. This is continued until the solution will absorb no more steam, when the surplus moisture must be driven off before the operation can be repeated.

At a recent trial of the boat, a representative of *Science* was permitted to witness the operation of charging the boiler, and to become a passenger in the boat during her submarine voyage. Water, heated under pressure to above the boiling-point, was pumped from a boiler on the deck of the torpedo-boat's tender to the inner compartment of the boat's boiler, and the outer compartment was filled with the soda solution previously heated to about 260° F. in a tank on the tender. The captain and engineer, accompanied by the *Science* reporter, descended into the boat through the manhole, which was then securely fastened on the inside. The captain took his place at the steer-



THE PEACEMAKER.

removed, and a Honigmann fireless boiler and a fourteen-horse-power steam-engine substituted. With these it is claimed that eight knots an hour for several hours may be maintained with one charge of caustic soda. The speed and steam-endurance depend, of course, upon the capacity of the boiler and the efficiency of the machinery.

The propulsion of the boat by steam power for any great length of time while submerged would not have been possible before Honigmann's invention, a few years ago, of the fireless boiler which bears his name. This invention is based upon the discovery that a solution of caustic soda liberates heat while absorbing steam, which heat may be utilized for the production of fresh steam. The Honigmann boiler, as used on the Peacemaker, is double, the inner part containing water and steam, and the outer surrounding vessel containing a saturated solution of caustic soda heated to within a few degrees of the boiling-point. The steam, after doing its work in the engine, is exhausted

ing-levers, with his head in the dome, the engineer and reporter stationing themselves at the engine. Light was furnished by two-candle-power electric lamps. The steam-gauge showed eighty pounds pressure. All being in readiness, water was admitted to the ballast-tanks until the dead-lights in the dome — which had up to this time been about a foot above water — were almost even with the surface. The order was then given to go ahead, the engine was started, and the boat shot ahead, showing only her 'fin' above water. The captain guided her movements with ease, describing curves, going straight ahead, or forcing her below the surface, until the pressure-gauge which communicated with the water on the outside showed a depth of forty feet. The steam-gauge showed a steady increase in pressure, from 80 pounds at the start, to 120 when the boat ran alongside the tender a half-hour later. The back-pressure gauge, which was connected with the soda-solution compartment of the boiler,

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showed an increase in the same time from 0 to 5 pounds. During this half-hour the air in the boat seemed to be reasonably pure, the heat was not as great as that in the engine-room of an ordinary steam-vessel, and there appeared to be no reason why such a voyage could not be continued for several hours without inconvenience to those on board.

NEW JERSEY SANITARY ASSOCIATION.

THE New Jersey sanitary association held its twelfth annual meeting at Trenton on the 19th and 20th of November. There were in attendance about one hundred members. The meeting was regarded by all as the most interesting and valuable the association has ever held.

We can give but brief mention of the proceedings. A paper on 'Disposal of house-sewage in districts not provided with sewers' was read by C. P. Bassett, C.E., of Newark. In the state of New Jersey there are only about a dozen of the towns which have any system of sewerage, and several of these are in a miserable condition. After denouncing the methods in vogue in places where no sewers exist and privy-vaults and cesspools abound, he referred to the advantages of the movable pail system in use in Birmingham, England, where 40,000 pails, representing 250,000 people, are collected weekly and carried to the dumping-station, where the contents are placed in a tank, treated with sulphuric acid, dried, and bagged for sale. The net cost is less than a cent a head annually. He next referred to the dry-earth system, but believed it could not secure wide popularity, the difficulties connected with the procurement of a proper supply of earth and the proper subsequent management of the waste being very great. The 'sub-irrigation' system was then described.

Shippin Wallace, Ph.D., of Burlington, read a paper on 'Preserved foods.' There are at the present time 800 factories in the United States engaged in the canning of foods. In these factories 500,000,000 cans are packed annually: of these, 50,000,000 are salmon, 72,000,000 tomatoes, and 25,000,000 corn. Although much has been said in the public press and elsewhere about the possible danger of poisoning from the contents of these cans, he believed there was no case on record of poisoning, either fatal or otherwise, where the materials were sound when packed. In discussing this paper, Professor Wilbur of Princeton college thought more attention should be paid to the cleanliness of the surroundings of canning-factories. He had examined one where the premises were in the most filthy condition. Dr. Davis said he had

occasion to examine a large number of operatives in canning-factories, and had found sores on their arms, and had reason to believe this was not uncommon. For this reason he thought that the sanitary authorities should make periodical visitations and inspections in all canning-factories. Dr. Quimby of Jersey City thought this sanitary supervision could be advantageously exercised over bakeries, sugar-houses, and candy-manufactories. Dr. Amering, president of the Society of American analysts, called attention to the sophistication of foods and drugs. In Philadelphia it was a common practice to use gelatine in cream-puffs, ice-cream, and charlotte russe, and the putrefaction of this had caused sickness in the consumers.

Dr. D. Benjamin of Camden followed with a paper on 'The relation between drinking-water and typhoid-fever.' He regarded the two as so intimately connected as to make it hardly ever worth the while to think of any other source for typhoid-fever. Dr. Baldwin of New Brunswick believed that it might be contracted in other ways; and Dr. Raymond of Brooklyn thought that it not infrequently was spread through the sewers, the infected discharges having been thrown into the soil-pipes without disinfection, and, through defects in the plumbing, sewer-air carrying the germs of the disease found its way into other houses. He regarded the two most important adjuncts in the eradication of typhoid-fever from towns or cities where the water-supply was good, and indeed for all places, as being a thorough disinfection of the discharges, and the correcting of all defects in the waste-pipes and traps. The total abolition of pumps in the city of Brooklyn had not produced much effect on typhoid-fever in that city, where it has existed with more or less prevalence from the time of the earliest records.

Other papers read were, 'Trap ventilation and the fresh-air inlets thereto,' by J. C. Bayles of Orange; 'The physical laws of pipes and fixtures and their contents,' by C. F. Brackett of Princeton; 'The duties of local inspectors, how best performed, and details of method,' by Henry Mitchell of Asbury Park; 'The work of the present and the immediate future for New Jersey health boards,' by Ezra M. Hunt; 'The physiological side of education,' by James M. Green of Long Branch; 'Physical restraint and relaxation in the schoolroom,' by Charles Jacobur of New Brunswick; 'The work of the plumber and the modes of conveying and disposing of sewage,' by J. J. Powers of Brooklyn; 'The chief points in sanitary administration, and the requirements as to vital returns and the notification of disease,' by J. H. Raymond of Brooklyn; 'What boards of

health can do to prevent adulteration of foods and drinks and the sale of dangerous illuminants,' by W. R. Newton of Paterson. Dr. Newton was elected president for the ensuing year. The association adjourned to meet at Trenton next year.

NOTES AND NEWS.

THE limits of glacial action in Russia appear on all our maps, according to the observations of Murchison and his colleagues many years ago, at a time when the glacial theory was in its infancy, and when the investigation of glacial records was in a very crude state. It is therefore welcome news to students in this branch of geology to learn that Nikitin, chief of the Russian geological bureau, has lately reviewed the question, utilizing all local information, so difficult of access to American readers from its being largely in Russian, and adding many special observations of his own. His discussion is published in the ninth number of Petermann's *Mittheilungen* for the current year, and is accompanied by a small-scale map showing the margin of the glaciated area, in which the characteristic indented outline clearly appears, though not on so remarkable a scale as in this country. The subdivision of the drift is not carried so far as it has been with us, and its influence on the topography is hardly considered: much further information may therefore be expected from later investigations.

—Although Mont Blanc has for a quarter of a century been French soil, its climbers have not usually shown an annual majority of Frenchmen; yet this has been the case this year. The ascent was made by 31 French (three of them ladies), 25 English (one lady), 10 Americans, seven Swiss (two ladies), six Germans, two Russians, two Swedes, one Italian, and one Belgian, — total, 85.

—Glanders is still quite prevalent in Brooklyn. But a short time ago the officers of Bergh's society found that a horse which had been transporting meat from a slaughter-house to the butcher-shops for eight months, had during all that time been suffering from glanders. The owner of the horse was arrested, and fined a hundred dollars, and, in default of its payment, was sent to jail. Three other horses have been attacked with the disease in the same stable, and all four have been killed. The number of horses which have been exposed during these many months is incalculable, and, unless rigid measures are taken, a widespread epidemic may be expected.

—The pharmaceutical society of Brooklyn has permanently established a course of lectures to be given annually to the drug-clerks of that society.

The course for the coming year includes lectures on poisons and their mode of action, antiseptics and disinfectants, chemistry as related to pharmacy, the microscope and its uses in pharmacy, and other subjects of importance and interest. The plan is an admirable one, and is worthy of reproduction by the pharmacists of other cities.

—The superintendent of buildings in Kansas City says that he finds very few buildings in that city in which the plumbing is as it should be. He finds that in some cases the only escape for sewer-gas is through the sink, the bath-tub, or the water-closet. He recommends the appointment of an inspector, whose duty it should be to examine the plumbing of all houses.

—Dr. Cyrus Edson's vigorous inspection of the food-supply of New York City is kept up with unabated vigor, and is undoubtedly preventive of much disease among the lower classes of the population. Recently Mr. Edson visited a wine-manufactory in Front Street, and reported that wine was being made by the following process: dried fruits, such as raisins, currants, and peaches, of low grade, are macerated with water, to which a certain amount of sugar is added. The mixture is then fermented, and, when fermentation is considered sufficiently advanced, it is checked by the addition of salicylic acid. The so-called wine is then clarified, flavored, and colored to resemble port, claret, or any other desired kind, the object being to imitate and undersell natural native wines. Dr. Edson claims that salicylic acid taken constantly, even in small doses, produces a depressing effect on the nervous system, and he believes the adulteration dangerous, and liable to cause illness. The manufacturer uses $4\frac{1}{2}$ grains of acid to a pint, and Dr. Edson condemned and seized all the wine that he found on the premises.

—M. Paul Janet has in press a new and revised edition of his valuable and suggestive work entitled 'Histoire de la science politique dans ses rapports avec la morale.'

—The French demand for English and German philosophical works seems to increase rather than diminish. M. Alcan has now in press translations of Spencer's 'Principles of sociology,' and of Preyer's 'Die seele des kindes.'

—In Belgium a royal decree of recent date has established at Ghent an academy of scholars and literary men, having for its object the study and cultivation of the languages and literature of the Netherlands. It is named Koninklijke vlaamsche academie for taal-en letterkunde. The king of the Belgians is the patron of the academy, which

is composed of three classes of members, — regular, honorary, and corresponding. The regular members are twenty-five in number, and the first eighteen nominations were made by the king. He named MM. Claeys, de Hondt, Delaet, Delcroix, de Pauw, de Potter, Gaillard, Genard, Gezelle, Hiel, Nolet de Brauwere van Steeland, Roersch, Rooses, Snieders, Stroobaut, van Beers, Vanderhagen, and P. Willems. M. Willems is president, and M. de Potter secretary, of the academy. It was opened on Oct. 10 by the minister of agriculture, industry, and public works.

— The London *Times* notices that Signor Costanzo Stella, one of the Italian deputation which visited Spain last summer, has written an interesting account of what he saw, and in it shows that Spain, though behind most nations of western Europe, is not by any means absolutely unprogressive. Signor Stella says that in 1799 the population of Spain scarcely reached ten millions, but at the end of 1882 it exceeded eighteen millions, this being tantamount to an increase of 8.40 per 1,000 inhabitants every year. The agricultural population, which was only 3,615,000 eighty-five years ago, is now 9,328,000, and the area under cultivation has increased from 53,000,000 to 193,750,000 acres, while there are now 38,000,000 head of cattle as against just half that number at the beginning of the century. The industrial population of Spain has risen from 1,035,000 to 3,038,000, and the number of manufactories, etc., from 883 to 13,911. The trade of the country has increased in proportion, the progress during the last twenty-five years being particularly remarkable, as, while the imports and exports together amounted to only £25,800,000 in 1860, they have been gradually increasing, and now reach £56,000,000. The increase extends to all branches of trade; for while Spain now produces 461,256,000 gallons of wine, of which about two-thirds are consumed in the country and the remainder exported, her railway system, which but five years ago did not reach 4,200 miles, is now not far short of 6,000 miles.

— The new edition of the 'Lectures and essays' of the late Professor Clifford brings the delightful writing and acute thinking of that wonderful intellect within the reach of a large number of readers. In this edition the introduction has been revised by its author, Frederick Pollock, and two essays which were included in the former edition have been omitted. They were those on 'Types of compound statement' and 'Instruments used in measurement,' and are to be found now among the 'Mathematical papers' published in 1882. We are glad to notice that Professor Clifford's portrait is retained.

— From the *Medical gazette* of Nantes, we learn that the Japanese have a remedy for hydrophobia which they call hoang-nan. It has recently been tried in twenty-four suspected cases. The daily dose of the drug in the form of the powdered root was from a hundred to a hundred and fifty grains. It is stated, that, up to the time of the last report, none of the patients had died. The histories of the cases are so incomplete that no inferences of any value can be drawn from them.

— A death has recently occurred from hemorrhage of the lungs, brought on by the irritation caused by the presence in that organ of six pine-leaves. Under what circumstances they found their way into the lungs is not reported.

— Professor Poncet, at a meeting of a medical society in Lyons, France, narrated an extremely interesting case in which pieces of bone were taken from a kid and grafted on to the tibia or leg-bone of a boy who had so suffered from the death of the bone as to necessitate the removal of a considerable portion of it. The wound in the leg healed, and the boy has now a firm and solid tibia.

— According to the *Medical record*, Dr. Louis Jobert has published a work on the cause and frequency of left-handedness. No purely left-handed race has ever been discovered, although there seems to be a difference in different tribes. Seventy per cent of the inhabitants of the Pendjab use the left hand by preference, and the greater number of the Hottentots and Bushmen of South Africa also use the left hand in preference to the right. Dr. Marro, as a result of his study of criminals, has found that from fourteen to twenty-two per cent of those who have been convicted of crime were left-handed, the highest ratio among people of all classes being only nine in the hundred.

— The contagiousness of leprosy has for a long time been a mooted question. The Royal college of physicians, in order to obtain the best information on this subject, sent inquiries to physicians throughout the world, whose practice had brought them in contact with the disease, and whose opinions would therefore be of value. Thirteen of these have no doubt of its contagiousness, and thirty-four entertain no doubt of its non-contagiousness. Twelve regarded leprosy and syphilis as being intimately related; twenty-one believed there was no relation. Most of those to whom the inquiries were sent regard leprosy as hereditary, and also that it may originate spontaneously under suitable conditions.

— During a recent voyage of the U. S. S. Juniata to South America, observations were

made as to the height and length of waves, with the following result, as reported by Commander Davis: height of wave from hollow to crest, 25 feet; length from crest to crest, 375 feet; wave-period, 7.5 seconds. The wind-velocity at the time was 10 miles per hour. The height of wave was measured by the elevation at which an observer could see over the crest when the ship was in the hollow. The wave-period was estimated by counting the average number of waves per minute. The wave-length was determined by the time occupied by the crest in passing a measured portion of the vessel's length.

—Mr. George A. Bacon of Syracuse, editor of the *Academy*, writes to tell us that the claim made in the newspapers that New York, Brooklyn, and Buffalo were the only cities in New York state without female representatives on the school board, to which we referred (*Science*, viii. No. 197), is without foundation. Mr. Bacon had before him, at the time of writing, the list of members of the school boards of Troy, Watertown, Saratoga, Ithaca, Auburn, Kingston, Syracuse, Poughkeepsie, Rochester, and Binghamton, and in no one of them did the name of a woman appear.

—The volume on Hume by Professor Knight of St. Andrews has been issued in Blackwood's series of 'Philosophical classics for English readers.'

—The report that Professor Tyndall would be able to give the course of Christmas lectures at the Royal institution proves to have been unfounded. It has been arranged for Professor Dewar to give them, and the subject will be the 'Chemistry of light and photography.'

—Dr. Thomas Dwight, the successor of Dr. Oliver Wendell Holmes as professor of anatomy at Harvard, has just published in the memoirs of the Boston society of natural history an article on the structure of bone. It is concerned chiefly with the arrangement of plates in the spongy bones as seen in sections made after maceration and drying. It is illustrated by three very beautiful photographic plates, and makes known a series of interesting observations. In the concluding section the author presents some general views, the character of which is indicated by the following quotations: "It is customary now to quote rudimentary organs and anatomical anomalies as evidences of descent; but it seems to me very improperly, occurring, as many of them do, quite out of the line of inheritance." "Clearly, the crude notion that accidental, purposeless, external forces should be sufficient to change by slow degrees one such organism into another of a different species, is untenable. The doctrine of chances alone shows it to be impossible. There

is, moreover, the unanswerable argument of the inevitable uselessness of incipient structures. Where we see the need, we see the structure to meet it already perfect. We see also the combination of homology with teleology." "The changes must be, for the most part, comparatively sudden, and therefore due to an implanted, internal force acting in predetermined directions. On the theory of external accidental forces, the preservation of homology is incomprehensible." It will be seen that Dr. Dwight is frankly opposed to what might be called the orthodox evolution of the day.

—The detailed programme of the course of lectures on Roman archeology to be delivered at the Johns Hopkins university by Prof. Rodolfo Lanciani of Rome, of which mention was made in *Science* (viii. No. 194), is now published. The lectures will begin on Tuesday, Jan. 4, and continue on successive Wednesdays, Fridays, and Mondays until Jan. 24. The subjects of the lectures are as follows: I. The foundation and prehistoric life of Rome; II. Fora and parks of ancient Rome; III. Public libraries of ancient and mediæval Rome; IV. The Tiber and maritime trade of Rome (quays, wharves, emporium, Ostia, *Portus Augusti*, treasures of the bed of the river); V. Police and garrison of Rome; VI. Palace of the Caesars; VII. House of the Vestals; VIII. House of the Vestals (continued); IX. The bronze statues of Rome, especially those lately discovered; X. The campagna (aqueducts, etc.).

—Alfred R. Wallace, LL.D., of London, is delivering a course of four illustrated lectures at the Peabody institute, Baltimore. His subjects are 'The theory of development,' and 'The origin and uses of color in animals and plants.'

—The Johns Hopkins university announces some new appointments to minor positions on the teaching staff. Adam T. Bruce, Ph.D., has been appointed instructor in osteology and mammalian anatomy, and Cameron Piggot, M.D., and Charles L. Reese, Ph.D., have been made assistants in the chemical laboratory.

—The water-tower near Coney Island which gave way while being tested recently, as mentioned in *Science* at the time, was 250 feet high, with a diameter of sixteen feet for the lower fifty feet. It then 'coned,' or decreased in diameter, in a length of twenty-five feet, to eight feet, which was continued to the top. The foundation, of concrete and brickwork, was twenty-two feet in diameter. The tower was constructed of steel plates, varying in thickness from one inch, in the plates at the lower part of the structure, to one-

fourth inch in those at the top. Ten wire-rope guys were used to steady the tower. When the test was being made, the water had reached a height of 227 feet, when a crack appeared near the bottom, running up about twenty feet, accompanied by a sharp rending sound. This was followed instantly by the total shattering of the lower part, and the fall of the tower, large fragments of the plates being thrown fifty or sixty feet from the foundation. The scene was visited soon after the disaster by an expert in water-tower construction, who states that "there was a distinct circular impress in the ground, overlapping the base somewhat, which would indicate an almost vertical fall of the upper part of the tower before it toppled over." The *Engineering news* says that this agrees with other statements made, as well as with the appearance of the wreckage about the base. The utter destruction of the lower part, and the general appearance of the fallen tower, which was broken in two just above the cone, and presented an almost clean square cut below the cone, resembled the sudden smashing of the lower part of a high glass cylinder, and the vertical drop and then toppling over of the upper part. The guys may have had some effect in maintaining the structure in a vertical position for a moment after the plates in the lower part had given way. These plates, it is said, were defective, and could not have stood any considerable test for tensile strength.

—The exports of printed books from the United Kingdom during the first six months of the current year show an increase in quantity, but a decrease in value. The totals are 54,299 hundredweight, valued at £496,768, as against 52,858 hundredweight, valued at £516,266, in the corresponding period of last year.

—A report on the newspapers of the world has recently been laid before the Imperial German diet. It would appear that there exist 34,000 newspapers, the total issues of which, during the year, amount to 592,000,000. Of these, 19,000 papers appear in Europe, 12,000 in North America, 775 in Asia, and 609 in South America; 16,500 are in the English language, 7,800 in German, 3,850 in French, and about 100 in Spanish.

—It will be remembered that Francis R. Brooks, formerly a student at Harvard, commenced suit against the authorities of that university to recover fifty thousand dollars damages for injuries which he received at the bursting of a retort containing sulphuric acid, which occurred during some experiments being made before the class last spring. The defendants have just filed their answer, in which they charge the plaintiff with lack of care,

negligence, disobedience, and neglect of instructions.

—In the winter of 1884 a fatal case of typhoid fever occurred in Brooklyn in a house the plumbing of which was in a defective condition. The widow of the deceased has commenced suit against the owner of the house to recover five thousand dollars for the loss of her husband, on the ground that the disease was contracted from the sewer through the defective house-drains.

—Dr. Hesse of Leipzig finds that bakers are especially liable to suffer from decayed teeth, and explains it by the lodgement of the dust from the flour in the teeth, where it undergoes acid fermentation.

—Dr. Foster Pratt, in the *Medical record*, estimates that our foreign-born population furnishes the great proportion of our criminal and diseased population. In 1850 they constituted one-tenth of the population, and furnished one-seventh of the insane; in 1880 they formed one-seventh of the population, and furnished one-third of the insane. The proportion of insane to the sane among natives, in 1880, was 1 to 662; among foreign-born, 1 to 250. He considers that the country is being loaded down with the defective classes of Europe, and believes that the matter is of so much importance as to demand serious attention.

—Koch's museum of hygiene in Berlin has been opened.

—One of the methods employed for the detection of defects in the sewer-pipes of houses is by introducing the oil of peppermint, diluted with water, into the pipes, preferably on the roof of the house, where the soil or waste pipes terminate, and to search within the house for the odor of the peppermint, which will be detected at or near the point where the defect exists. The *Sanitary engineer* figures and describes an apparatus consisting of a receiver, a rubber ball or bellows, and rubber tubing, by means of which the test solution can be injected into the waste-pipes of the house in which defects are suspected to exist. How this works practically we do not know, but it certainly has some advantages over the old method, for, as is often the case, the pipes have no opening at the roof, or other convenient place, into which the solution can be poured. The tubing of the apparatus we here refer to can be passed into the soil-pipe through the trap, and the peppermint then injected.

—Cholera, whose presence in Hungary we had occasion to chronicle some time ago, appears to be still raging in that and neighboring countries. But one case has, so far as is announced, occurred in Vienna; but of its true nature there is no

doubt. At Szegedin, in the first nine days of its existence, 284 persons had been attacked, of which number 124 had died. In Trieste in one week there were 70 cases, of which 39 were fatal. The disease has existed in this city certainly since June, during which time it has attacked 859 persons, 271 of whom have succumbed. The disease has also ravaged Istria, having had since July, in that province alone, 662 victims, with 368 deaths. The appearance of this malady in Buenos Ayres seems to be well authenticated, and some of the southern ports of our own country, notably Galveston and New Orleans, which are in commercial intercourse with that country, have already instituted a quarantine against it. It is said that there are a number of vessels due in these two ports from Buenos Ayres about Christmas.

— The St. Petersburg *Oriental review* of Nov. 4 says that the eminent Mongolian explorer Potanin returned safely on the 22d of October to the Siberian frontier town of Kiachta, after an absence of three years spent in the exploration of Mongolia and China. Throughout his long and difficult journey, Mr. Potanin was accompanied by his wife. The expedition was undertaken by order and at the expense of the Imperial Russian geographical society; and the *Oriental review* says, "We expect the richest and most valuable results from this scientific exploration of China and Mongolia."

— The meeting of the next oriental congress has been postponed until 1890. The executive committee of the congress is preparing a memorial, which will be signed by the Archduke Renier, to the trustees of the British museum and the British secretary of state for home affairs, praying that a bill be introduced into parliament empowering the museum to lend the oriental manuscripts in its possession to foreign savants.

— The physical hydrographic field-work of the coast survey in New York bay and harbor has closed for the season, and Professor Mitchell is now at the home office working up his notes. The computations of pendulum work of Lieutenant Greely's party at Lady Franklin Bay are expected to be completed by Dec. 1. The coast survey report for 1885 will be ready for distribution about Jan. 1. It contains a number of valuable appendices, among them 'The magnetic dip intensities,' by C. A. Schott, and 'The currents and temperatures of the Gulf Stream,' by Lieut. J. E. Pillsbury, U.S.N. Owing to the lack of funds to prosecute the topographic work in California, all operations there will be closed for the season about Dec. 15.

LETTERS TO THE EDITOR.

*Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Laws against quacks.

My attention has been called to an editorial note on p. 447 of *Science* (viii. No. 198), in which, apropos of a recent arrest of one violating the law regulating the practice of medicine in this state, injustice is done to the Medical society of the county of New York.

I assume that this injustice, which seems to have arisen out of a misapprehension both of the law and the facts of the case, was of course unintentional, and that you will give equal publicity to the statement of the counsel of that society, who caused the arrest, and was successful in the action, which, as you said, was brought against him for damages.

The part of your note to which I except runs as follows: "It is absurd as a matter of common sense that registration in one county should not be sufficient, rather than that a man should be required to register in all the counties of the state if he desires to practise in them; and, as appears from an unwritten opinion given by two judges of the supreme court of this state, it is equally absurd as a matter of law." As to the absurdity, from the stand-point of common sense, of requiring registration in every county in which a physician regularly practices, I venture to differ with you: that is a mere matter of opinion. The object of the law is to provide in every county a list of physicians regularly practicing therein, for the information of the public and the protection of physicians against prosecution. The construction you give the law would necessitate the examination of the records in the offices of sixty county clerks, before any prosecution could be commenced; and you might with as much justice declare it a hardship to require a judgment to be docketed in every county in which it is to be enforced. The only theory on which it is absurd to require a physician moving from one county to another to register in the latter, is this: that the act of registration *per se* has some saving grace whereby a physician who performs it becomes wiser and more skilful in his calling. But, unless registration is analogous to baptism, I fail to see the absurdity you declare exists; although I readily admit that a state registration law, like that provided for in the medical act of Great Britain, would be a great improvement over the present clumsy system. The second part of your sentence, however, is a statement, not of opinion, but of fact, and is absolutely incorrect. No judge or judges in this state have rendered any such opinion as you mention. On the contrary, four years ago, in the case of *Hayes vs. Webster*, — an action against the president of the county society for malicious prosecution in causing the arrest of a practitioner registered in Queens county, — Judge Freedman, of the superior court of this city, directed a verdict for defendant on the ground that not only was the arrest on probable cause, but that it was President Webster's duty to make it. In the case against myself, to which you refer, Judge Lewis of the supreme court directed a verdict in my favor on the plaintiff's own testimony, upon the same grounds. The criminal courts have held in the same way. In Texas, under a statute like ours, the court of appeals has held, that, on removal from one county to another, a physician must register anew. The court said, "The object of the law was to protect the

people against charlatans and quacks. To attain this purpose most effectually, no better plan could have been devised than to require that the people, at least, should be notified in advance, or have at their command the means of notifying themselves, of the authority and qualifications of those proposing to engage in a profession so nearly affecting the lives and health of themselves and families. Without some such notice and information, the law would become entirely nugatory" (Hilliard vs. The state, 7 Tex. appeals 89). The clerk of Kings county in this matter is a law to himself. There is no decision to sustain his position, and I have his admission that what you call 'an opinion' is not an opinion in any legal sense of the term.

One word as to the facts in the case you refer to. A notice calling the attention of the person arrested to the law was mailed him, and another was sent to his house. No reply was received to either. A 'sandwich advertisement' paraded Broome Street, calling attention to the 'Live and let live dispensary' conducted in his name. It is true he was locked up for fifteen minutes, but owing, I was told, to his conduct in the court. His entire detention did not last three hours. I consented to his discharge when I found that he was technically able to obey the law. He claimed to have offended through ignorance, and I accepted his statement without thoroughly believing it. I could have convicted him. He rewarded my leniency by bringing his absurd suit, that had no chance of success. He admitted, on cross-examination, that his verified complaint did not truly and fully state the facts of his arrest and the charge against him.

I have written at some length because you have been evidently misled. It is not possible for you to find an instance—I will not say of a reputable practitioner—of a person technically qualified to practise physic, or able to so qualify, who has been improperly prosecuted by the society. What has been done during the year by them appears in their annual report.

W. A. PURRINGTON.

New York, Nov. 29.

[The letter which we print above comes too late to enable us to ascertain whether the case to which our correspondent refers in the next to the last paragraph of his letter is the same as the one to which we had reference in the editorial on p. 447 of *Science* (viii. No. 198); but we shall immediately investigate it, and, if any injustice has been done in the matter, it shall be rectified. The facts as stated by us were received from the physician himself, and we have known him for many years as a reputable practitioner and a graduate of one of the best medical colleges in the country. In reference to the 'opinion,' we do not know exactly how formal a declaration must be to make it 'legal,' but there is in the office of the county clerk of Kings county a memorandum, made by the clerk in his official book of registration, that on a given date, which we do not now recall, in the year 1885, Justices Cullen and Bartlett of the supreme court, on an application for advice by the clerk, gave it as their opinion that it was absurd that a physician should be expected to register in every county of the state, and that opinion has been the guide of the county clerk in the matter. We regret that we are unable to give the exact language of this opinion by reason of lack of time, but will do so in our next issue. — Ed.]

The teaching of natural history.

Referring to your last issue, 'A Reader's' difficulty seems to be that he looks upon the scientific name of an object as an *end-in-itself*; and, if I were to respond to his invitation to turn instructor in natural history for his special benefit, I should roughly counsel him (for he is evidently an old sinner), first of all to let names altogether alone. As, however, this is my first essay in teaching, I may be quite at fault, and perhaps am leaning too much on my own experience, when, after three years of working by myself on the name-plan, and thinking I knew a precious bit of entomology, I was brought to a dead halt by Agassiz, who gave me the outside of one dead fish to stare at for three long days, and afterwards some hundreds to describe and classify without any books and without any names. Letters and numerals were enough for that; and not till the work was done did I know what other people called these fish, otherwise than that Agassiz used the single word 'Haemulon' for them all, used simply as 'fish' might be,—as a mere convenience. Needless to say that I returned to entomology with a different and a more humble spirit. Looking as I do upon that lesson as my set-off in science, I may be giving it a too universal application, for I have had no experience in actual teaching; still, if I were to sum up my own conviction as to the proper method of teaching in natural history, it would be: specimens rather than (but not necessarily without) books; relationship rather than (but not necessarily excluding) names.

Now, to apply this to the little book (French's 'Butterflies') which seems to have sprung this discussion on a suffering public, and is thereby pretty well advertised. How much does it help a student to understand the relationship of our butterflies? There are three ways of doing this: 1°. By the actual arrangement of the material, a method which in the nature of things cannot be avoided. No reason for the particular sequence employed is given. 2°. By the definition of the groups. The arrangement provides for five families, twelve subfamilies or similar divisions, and fifty-one genera. Not a single one of the genera is defined; and, though short descriptions are given of the higher groups, these occupy, in all, scarcely more than 5 of the 305 pages given to the descriptive part of the book; all the rest is devoted to species. 3°. By analytical keys. One general key is given, and it occupies nearly twenty-six pages. Your reviewer called this "fairly good, so far as the perfect insect goes," and afterwards "faulty, because largely made up of unimportant characters, and because it takes no account of the earlier stages." 'A teacher' replies, "The key does trace into the families, the genera, and the species; and all the families and genera are more or less fully characterized either in the key or in the body of the work." As stated above, not one genus is characterized as such in the body of the work; therefore this must be interpreted as saying that all the genera are characterized in the key. This is true of all but *Melitaea* (the names of *Neonympha* and *Calephelis* having been accidentally omitted in their proper place); but let us see what the characterization amounts to, as a clew to arrangement or comparative structure. There are, in all, 443 categories used; but as 214 of these lead directly to species only, in which structural differences are much less to

be looked for, and which therefore may be omitted so as to place the key in the most favorable light, there remain 229, which lead to families, genera, and groups of species. Now, what characters are employed in these higher categories? Will it be believed that there are only about one-fourth of them which have the slightest allusion to a single structural feature? That seventy-two per cent are altogether given up to the mere matter of the coloring of the wings, rarely including even the distribution of this color in patterns? This is the key which 'A. Reader' pronounces 'excellent;' which subserves no possible use as a guide to relative structure or affinities, but only to discover a name. Its author and 'A. Reader' appear to be afflicted with the same malady. Your reviewer surely made a mistake in calling the key 'fairly good,' for it teaches nothing of the basis of affinities, which it might have been made to do without lessening one whit its value in the special direction sought.

SAMUEL H. SCUDDER.

Cambridge, Nov. 26.

Abnormal embryos of trout and salmon.

In *Science Observer*, vol. v. No. 1, pp. 1-8, S. Garman and S. F. Denton have figured and described a number of abnormal embryos of trout and salmon; and, under the head of 'Conclusions,' offered "a few conjectures as to the cause and manner of origin of these monstrosities." These conjectures appear to merit a word of comment. Considering it improbable that many of the forms described could arise by fission, an attempt is made to account for their origin at separate points of the surface of the vitellus. It is argued that several spermatozoa must penetrate the egg-membrane at different points. But how can they accomplish this when only one place—the micropyle—has been provided for their entrance? The possibility—not to say probability—of all passing through the micropyle does not appear as one of the conjectures. 'Plurality of micropyles' is noted as one of the possibilities, but another hypothesis is urged as the more acceptable; namely, imperfections in the egg-membrane, due to premature extrusion of the eggs. "The finishing touches being put on the outer covering of the egg, the capsule is most likely to prove unfinished if the eggs are taken too soon. . . . While the capsule in maturity may resist the intrusion of spermatozoa, compelling entrance at the micropyle, in imperfect condition the same capsule would prove a less effective barrier at its pores or elsewhere." All this seems to be disposed of by the well-known fact that the membrane is formed long before the egg is ripe enough to develop. It has been shown that the micropyle is only large enough to admit one spermatozoon at a time, and the impossibility of entering the minute pores has been pointed out more than once.

A strange assumption underlies most of these conjectures: it is the idea that a spermatozoon, without uniting with the female pronucleus, can give rise to an embryo. This point is not directly asserted, but taken for granted, as if it had nothing unnatural or preposterous in it. In the light of what is now known of fecundation, such an idea, to say the least, is wholly untenable. But if this idea is dropped, most of the 'conclusions' are left completely in the air.

That superfetation may be the cause, or one of the

causes, which leads to the formation of monsters, has been made very probable by recent observations; but we can hardly regard this as a certainty so long as such men as Professor Kupffer maintain that more than one spermatozoon is required for the normal fertilization of these very fish-eggs.

As to the mode of origin of monsters,—if I may be allowed to express an opinion on the merits of the various theories that have been offered on the subject,—I should say that Lereboullet and Rauber are the only ones who have succeeded in presenting views which are acceptable from an embryological stand-point. Rauber has dealt with the subject in a very thorough manner, and has shown how two or more embryos could arise from the same germ-ring. If two embryos were formed at opposite sides of the ring, their final position would be on opposite sides of the egg, with the heads pointing in the same direction, precisely as represented in the figures of Garman and Denton. We can hardly do better than accept this view until something better is offered to replace it. In supposing themselves limited to the alternatives of, 1°, fission, and, 2°, formation at different germinal centres, these authors have entirely overlooked the more rational mode of interpretation suggested by Lereboullet (*Ann. des sc. nat.*, 1863), and amplified and extended by Professor Rauber (*Virchow's Arch. f. pathol. anat.* lxxi. No. 1, and 'Primitivstreifen und neurula der wirbelthiere,' Leipzig, 1877).

C. O. WHITMAN.

Milwaukee, Nov. 25.

The deepest fresh-water lake in America.

Mr. L. W. Bailey's letter with the above heading (*Science*, viii p. 412), calling attention to the extraordinary depth of Crater Lake in Oregon, seems to indicate that he regards Lake Temisconata, in the Province of Quebec in Canada, as being an exceptionally deep fresh-water lake. The subjoined figures will illustrate to what extent this idea is sustained by actual soundings:—

Fresh-water lake.	Height of surface above sea.		Maximum depth.		
	Feet.	Metros.	Feet.	Metros.	
Temisconata Superior.....	400	121.9	500	152.4	Bailey.
Michigan.....	609	185.6	1,010	307.8	Lake survey.
Huron.....	582	177.4	864	263.3	" "
Erie.....	573	174.6	708	214.9	" "
Ontario.....	247	75.3	324	98.7	" "
Tahoe.....	6,247	1,904.1	1,645	501.4	LeConte.
Crater.....	—	—	1,996	608.4	Dutton.
Leman.....	1,226	373.7	1,017	310.0	Forel.
Como.....	699	213.0	1,926	587.0	
Maggiore.....	688	209.0	2,613	796.0	
Baikal.....	1,360	414.5	13,356	3,766.0	

There seem to be unaccountable discrepancies in the depths assigned by different authorities to the chain of lakes lying between Canada and the United States. The table of mean depths given in Johnston's 'Physical atlas' and in Herschel's 'Physical geography' must be erroneous. Some authorities give the maximum depth of Huron as about 1,300 feet. The depth of Lake Baikal appears to be almost incredible (*vide Nature*, xvii. p. 468).

JOHN LECONTE.

Berkeley, Cal., Nov. 17.

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SCIENCE.—SUPPLEMENT.

FRIDAY, DECEMBER 3, 1886.

THE PANAMA CANAL.¹

THE Isthmus of Panama is the narrow neck of land which connects North America with South America. It is bounded on the east by the Caribbean Sea, and on the west by the Pacific, extending northwards to the state of Costa Rica, and southwards to the territory of Colombia (New Granada).

The backbone of the isthmus is formed by a prolongation of the Cordilleras. Nearing Aspinwall, the town on the Atlantic side, the country presents little variety; but as one proceeds towards the interior, the landscape undergoes a rapid change, the country becomes mountainous, and is cut up into deep valleys, whose sides are covered with rich tropical vegetation.

From the hydrographical stand-point, one is struck by the number of streams,—one can scarcely call them rivers,—such as the Rio Trinidad and the Rio Gatuncillo, each of which, during the rainy season, has a volume of 14,130 cubic feet at its widest part. The most important of these streams, however, is the Chagres, which, rising near the north-west coast, makes an immense bend, and finally empties its waters into the Caribbean Sea. The volume of water discharged by the Chagres at its mouth is, in summer 460 cubic feet, in winter 21,190 cubic feet; but in exceptional circumstances it sometimes reaches as high as 56,510 cubic feet per second during the latter season.

The Panama canal company has erected an observatory at Gamboa, about 100 feet above the sea-level, where for some time observations have been carried on, with the result of establishing the following meteorological facts:—

	Rainy season.	Dry season.
Average temperature.....	86°.4 F.	89°.3 F.
Barometric mean.....	29.892 inches.	29.922 inches
Hygrometric mean	96.	88.

The temperature ranges between the extremes 25° and 35°.

The year is divided into two seasons, the dry (*verano*) and the wet (*invierno*). The dry season continues from December to May, the interval between it and the wet season being occupied by the short but delightful 'St. John's summer' (*veranito*).

¹ From *The Scottish geographical magazine*, November.

The advantages of establishing a waterway between the Pacific and the Atlantic were recognized in the beginning of the sixteenth century, and as early as 1550 four projects were already before the world, one of them suggesting a passage by the Isthmus of Panama. But the data were too vague to give rise to the formation of any definite scheme. The geography of the isthmus was practically unknown, and rumor whispered strange and disquieting reports of an inhospitable soil and dangerous natives. One explorer succeeded another without throwing any new light on the matter; and the seventeenth century passed away, leaving the great problem still unsolved. Not, indeed, until 1780 do we come upon any thing like an attempt at scientific exploration. In that year, however, an expedition was organized under the command of two engineers, — Martin de la Bastide, a Frenchman; and Don Manuel Galistro, a Spaniard. Unfortunately, when these men returned to Spain, they found the whole attention of the nation occupied by the political situation; and, the death of Charles III. occurring shortly afterwards, all hope of a practical outcome of their researches speedily vanished.

In 1844, a French engineer, Napoléon Garella, succeeded at length in establishing exact data for the simultaneous construction of a railway and canal across the isthmus. A French company was formed for the construction of the railway, but from one cause or another delays arose: the directors lacked energy, the revolution of 1848 supervened, and the work was finally carried through by an American company.

Convinced of the importance of an inter-oceanic canal, America inaugurated a series of investigations, some of which were never fully carried out, while others ended in failure, more than one explorer meeting an untimely if glorious death in the endeavor to achieve success. The American government itself fitted out a properly organized scientific expedition, but without any definite result: the problem still remained unsolved.

At last, in 1875, the Geographical congress at Paris, to which were submitted the various schemes already suggested, decided that a new and thorough investigation should be made. A society of exploration was formed, the necessary funds were raised, and two naval officers, MM. Reclus and N. B. Wyse, with an engineer, M.

Celler, were sent out to survey the isthmus and judge of the relative merits of the various regions suggested as suitable for the construction of a canal. After three years of incessant toil, they returned to Paris to give an account of their mission. Another congress met at Paris in 1879, and, after careful examination and consideration of all the proposed schemes, decided by a majority of seventy-eight that the canal should be constructed between Aspinwall and Panama, without tunnels or locks, from ocean to ocean. The routes by Tehuantepec, by Nicaragua, by Atrato and Napipi,

by Darien (the proposal of San Blas) were, on the report of M. Voisin-Bey, rejected as unsuitable on account of technical difficulties. The cost was estimated by the commission of the congress at £44,585,000, exclusive of the interest on the capital engaged.

The route of the new waterway will be from the east side of the Bay of Limon on the Atlantic coast, by the valleys of the Chagres, the Obispo, and the Rio Grande to the Bay of Panama, entering the Pacific near the islands of Naos and Clamenca. Its total length will be 73 kilometres, or 45 miles, and, like the Suez canal, it will be absolutely open and unobstructed throughout. On the Pacific side a dock will be constructed so as to insure free communication with the ocean at all hours and all states of the tide. The width of the cutting at the bottom will be 72 feet; at the water-level it will be 164 feet in soil and 105 in rock; its average depth, 30 feet below the mean level of the oceans. There will be two ports, Colon and Panama, and a dam will be constructed at Gamboa to regulate the waters of the Chagres.

At Colon or Aspinwall the company has reclaimed from the sea a large tract of land, where

a new town has been built, named after Christopher Columbus. The streets are wide and regular, affording free play to the fresh sea-breezes; and here a number of the officials of the company are already located in commodious dwellings.

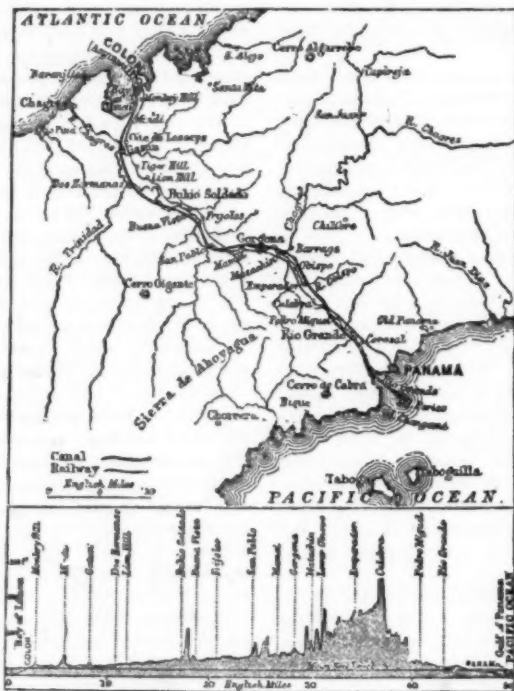
The cutting of the canal presents no difficulty for the first fifteen miles after leaving Colon. For that distance, as also from the sixty-second (38½ miles) to the seventy-third kilometre (45 miles), the soil consists chiefly of clay and mud; so that for 21½ miles operations may be carried on by means

of dredging, the cheapest and most expeditious mode of excavation. From the twenty-fourth (15 miles) to the thirty-fifth (21½ miles) kilometre no serious obstacle to progress occurs, but between the thirty-fifth and sixty-second kilometres it will be necessary in great measure to carry on the work by means of dynamite.

The port at Aspinwall is already nearly completed, and that at Panama presents no technical difficulties. Outside the latter there will be 'roads' formed by a maritime channel, where vessels may lie previous to entering the canal. The left bank of

this channel can easily be made to communicate by road with the Panama railway. At Panama the company has acquired land favorably situated for the construction of wet and dry docks, dock-yards, and warehouses, and all the adjuncts necessary to the maintenance of an extensive mercantile and shipping industry.

From fifteen to twenty thousand workmen, mostly from Jamaica, Colombia, and the Antilles, are already employed on the canal banks, and this number could easily be doubled. The construction of the banks has been intrusted to a number



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of contractors, each of whom is bound down to have his portion of the work completed within a given time, the company retaining the power of breaking the contract at a moment's notice should the work prove unsatisfactory. It is confidently expected that the canal will be finished by the end of 1889.

It only remains for us now to consider briefly the importance of the canal for the commerce of the world in general. It is almost unnecessary to speak of the saving in time and money that will be effected when the necessity for the long and perilous voyage round Cape Horn has been obviated. The following table shows, in round numbers, the distance in miles saved between various ports:—

Names of ports.	Distance by Cape Horn.	Distance by Panama canal.	Distance saved.
London or Liverpool to San Francisco.....	16,900	8,900	8,700
Batavia to San Francisco.....	16,100	7,900	8,200
London to Sydney.....	16,400	10,900	5,500
Batavia to Sydney.....	16,100	10,600	5,500
Bordeaux or Havre to Valparaiso.....	10,900	7,450	3,450
London to Sandwich Islands.....	14,900	7,900	7,000
New York to Valparaiso.....	10,600	3,900	6,700
New York to Callao.....	11,300	3,000	8,300
New York to Guayaquil.....	12,000	2,400	9,600
New York to San Diego.....	15,400	2,700	11,700
New York to San Francisco.....	15,900	4,300	11,700
New York to Vancouver.....	16,600	4,600	12,000

This saving of distance will confer a great benefit on merchants and traders, who will thereby be enabled to get their goods more quickly into the market. It will also effect such a saving on insurance, both of goods and shipping, as will cover the extra expense of the dues levied on going through the canal.

The field for commercial enterprise opened up to the world by means of the Panama canal is immense, comprising, as it does, Peru, Chili, Colombia, W. Mexico, California, Oregon, the north of China, Japan, East Australia, and a great part of Polynesia. By request of the International congress of 1879, a report was drawn up by M. Levasseur, estimating the future traffic of the new route. From the statistics at his command, M. Levasseur estimated the total annual traffic at seven and a quarter million tons, of which five and a quarter million represents the traffic between Pacific and Atlantic ports; the remaining two millions, that between Europe and the east. This, however, he states to be only the net tonnage, which is less than the gross and actual tonnage by about a third,—a not unimportant consideration as regards the revenue of the canal. Thus, dues at the rate of 12s. 6d. per ton will an-

nually be levied on ten millions aggregate tonnage; and the company has an additional source of income in an immense tract of land (1,930 square miles) with all the minerals it may contain,—the gift of the Colombian government.

The Panama canal will have no prejudicial effect on the Suez canal; rather it will be the complement of it. The two great highways of commerce and civilization are absolutely distinct, and there can be no rivalry between the two great maritime canals,—that of the east and that of the west. The Suez canal is the open door between Europe and the north of Africa, on the one hand, and the south of Asia and its archipelago, on the other. The Panama canal opens up a way for Europe and America to carry on their commerce with the western shores of the great western continents, with the north of China and Japan, and with Australia.

The commercial revolution effected by the cutting of the Suez canal will be altogether surpassed by the similar revolution now about to be effected by the cutting of the Isthmus of Panama. The Suez canal could only be used by steamers, and when it was opened the commercial world was not yet ready for it. The Panama canal, on the contrary, may be used by steamers and sailing-vessels alike. The commercial world is eagerly awaiting its opening, and from the very first the advantages it affords will be gladly seized. M. Amédée Marteau, the editor of the *Journal de Havre*, has devoted an article to the Panama canal, in which he estimates the number of tons that would have passed through it had it been open in 1884. Founding his conclusions on official documents, he says:—

“We are in a position to state exactly and precisely, without hypothesis and without exaggeration, the amount of tonnage now passing between Europe and America, Asia and Oceania, three-fourths of which must go round by Cape Horn or the Cape of Good Hope, a détour which the opening of the Panama canal will henceforward render unnecessary. The total tonnage is as follows:—

1. Between Europe and the Pacific coasts.....	2,570,774 tons.
2. Between Europe and Australia, Oceania, Malaysia, and the Philippine Islands.....	2,696,754 “
3. Between the United States and the above regions (except San Francisco), besides India, China, and Japan.....	1,619,440 “
Total.....	6,886,968 tons.

6,886,968 tons in 1884 represents 8,539,840 in 1888, the average increase of tonnage being six per cent per annum. Eight and a half million tons, paying dues at the rate of 12s. 6d. per ton, would give a revenue of £5,312,500, exclusive of the in-

come derived from the company's land, passenger dues, etc.

"In this estimate," continues M. Amédée Mar-teau, "not having full statistics, we have taken no account of the present and future trade of the Atlantic ports of South America and the Antilles, with all parts of the Pacific, which cannot be reckoned at less than half a million tons. Neither have we attempted to estimate the increase of European and North American tonnage which must result from the impetus given to the trade with the Pacific and Oceania, and which probably would not amount to less than an additional one or two million tons."

The aggregate tonnage, therefore, that will annually pass through the canal must be reckoned at about eleven or twelve million tons. The cost of the canal is estimated at about £50,000,000, and the interest due annually to share and bond-holders amounts to £3,000,000.

FERDINAND DE LESSEPS.

A PLEA FOR THE SENSE OF SMELL.

THE division of the five senses into higher and lower has carried with it both a moral and an aesthetic implication. While it is granted as a general proposition that sight and hearing have been the aesthetic educators of our race, yet at various times have attempts been made to rescue one or other of the remaining senses from the aesthetic degradation to which they were consigned. The aesthetic value of the tactile-matter group of sensations is deduced from the educability of the blind as regards artistic conceptions. That taste and smell play a real and worthy rôle in aesthetic life is the claim of every epicure. The very word which we use to denote artistic appreciation, 'taste,' owes its origin to this class of sensations. A recent writer¹ in this field urges the claim that the sense of taste has no right to the aesthetic position it occupies, and that it has usurped the place that of right belongs to smell. The question discussed is that of the 'gastronomic value of odors.' The point of view can be most briefly described as epicurean. The thesis is, that the pleasures of the table usually assigned as 'matters of taste' are really 'matters of smell.'

Taste and smell have all along acted in such close association, — have, so to speak, gone to the same school, learned the same lessons, enjoyed the same pleasures, and suffered the same pains, — that they have almost come to be regarded as one sense: only by special artificial means do we fully realize their dual nature. That a blindfolded person, clapping his nose tightly, will not be able

to distinguish between beef, mutton, veal, or pork will be similarly confused by bits of chicken, turkey, and duck, etc., is a familiar experience. Apart from the different kinds of feeling which these food-stuffs produce in the mouth, they are distinguished by smell alone. Hence, to get the real pleasure of eating, one must smell the food. True, society discountenances this proceeding if done in the ordinary way: but, says Mr. Finck, there is a second way of smelling not usually recognized except unconsciously by gastronomists; viz., by exhaling through the nose. In ordinary expiration the air does not touch the olfactory region of the nostril; but by a special effort the air laden with all the perfumes that make up the epicure's paradise can be turned into that direction. On this depends the art of eating. There are great individual differences in the power of accomplishing this result, and perhaps color-blindness has its analogy in smell. On the other hand, gastronomic practice for smell is as essential as artistic training for color. In both cases the teaching is largely unconscious, and instinct points out the best method of enjoying food. The mistake is, that we call every mouth-sensation a taste, and do not analyze it physiologically.

Taste is a very meagre sense: at best we distinguish six kinds, — alkaline, metallic, bitter, sour, sweet, and saline. The first two have no gastronomic value; salt is at best 'that which spoils the soup if it isn't put in,' and is not relished for its own sake; while a taste for bitter is a morbid craving for contrast, at which the unsophisticated tongue of children would revolt. Even sour and sweet must be allied with fragrance, to yield much pleasure. What we call sour is usually a combination of tastes, smells, and touches. We distinguish one sour from another by the accompanying odor. Sweetness is the 'only original and genuine' pleasure of the overrated sense of taste. Yet even here the pleasure would be small if smell did not aid. "Were taste alone to be considered, confectioners might as well close their shops, and leave the sale of sugar to grocers." No one cares much for plain sugar: even children soon learn to prefer candy; i.e., flavored sugar.

"A few gifted mortals, known as epicures, have had an instinctive knowledge of the importance of odors, and the same is true of a few original and immortal cooks." The two main obstacles to the recognition of the gastronomic reform embodied in the principle that the object of cookery is to develop the "countless delicious perfumes latent in the raw material of food, or to add others when the food is deficient in natural flavor," are the "amazing gastronomic indifference

¹ Henry T. Finck, *Contemporary review*, November.

of mankind" and the "notion that there is something unrefined in the undisguised enjoyment of a meal." The cure for the first is a right education; the second is a relic of asceticism shown at its worst in the superstition that it is exquisitely refined and feminine for a girl to have no appetite. Epicures are healthy because they 'live on the quintessence of food' by constantly breathing through the nose. The epicure's habit of retaining this pleasure as long as possible leads to slow eating and complete mastication. Odors stimulate the flow of saliva and the other alimentary juices, and thus a gastronomist will never be a dyspeptic. Epicureanism is not gluttony; it is the ability to get pleasure out of commonplace foods. He may prefer "canvas-back duck to roast goose," but "he alone knows what an oriental rose-garden of magic perfumes may be found in the simplest crust of whole-meal or graham bread and butter."

In this strain Mr. Fincks develops the science of eating and of cooking, and applies its principles to several important classes of food-stuffs. He even proposes a new industry; namely, of so feeding poultry and other animals as to produce a special brand of meat with original *nuances* of flavor. And finally he promises us that the recognition of the royal position of smell in the gastronomic hierarchy would bring about an increase of twenty per cent or more in the average health and happiness of the community.

The notorious Jaeger holds that the soul is a smell; we have now been given reasons for believing that smell is at the least the breath of life.

— J. J.

A RECENT CONTRIBUTION TO THE DISCUSSION OF HYPNOTISM.

THE French psychologists seem to be making their own the study of whole groups of mental phenomena. Of late years, almost all the valuable contributions to the subject of hypnotism, and all phenomena, have come from them. In fact, they have discovered so many new and striking facts, that almost all the old generalizations have been overthrown, and the multiplicity of facts has hardly as yet been digested into any new theory. One of the most interesting of recent discussions is that of Burgson in the November number of the *Revue philosophique*. It is valuable not only for the new light thrown upon some of the most mysterious phenomena of hypnotism, but for the suggestions which it offers to a study of the whole complex field of 'thought-transferrence.'

From time to time there have been reports of hypnotic persons who could see through opaque

objects, tell what was going on at a distance, etc. The case of some boys who could tell the title of the chapter at the head of a page, or the number of the page, when a book was opened but was held with its cover towards them, was reported to Burgson. Upon trying it, he found that one of the boys told correctly at least every other time what was required. Some experimenters would have stopped short with this, and would have heralded abroad a remarkable case of telepathic action. But Burgson continued experimenting. He noticed three things. When the hypnotized subject was asked how he knew, for example, the figures of a page, he replied that he saw them; and when he was asked to touch the back of the book, instead of touching the cover, he put his hand under and touched the open page. Another fact was, that, when the boy did not guess right the first time, he would often correct it, if the book were moved a few inches nearer or farther from the eye of the operator. The third thing was, that the figures were often read reversed, as 213 for 312. This suggested to the operator that the patient seemed to be reading as if in a mirror, and he began to wonder if it were possible that the latter read the figures or word as reflected in the cornea of himself, the operator. Simple experiments revealed, that, if the operator's eyes were closed as soon as the figure had been seen, the patient was rarely successful; that the attitude which gave the best chance for the formation of a distinct image was that in which the guess was most uniformly successful; and that the correctness of the guess decreased as the light was changed so as to obscure the reflection. The image in the cornea could not be, however, more than .1 mm. in size. In spite of the well-attested hyperaesthesia of organs in hypnotic subjects, there might be some doubt of an ability to see any thing so small. Experiments were then tried with a view to deciding this point. The most satisfactory consisted in giving the subject a prepared section of an orchid the cells of whose tissue were only .06 mm. in diameter, and telling him to draw the same. With microscopic fineness of vision this was done.

It only remained to see if the hypnotic patient's power of forming conclusions from very subtle and ordinarily imperceptible signs was confined to cornea-reading. It was easily proved that it was not. The operator hypnotized the subject sitting before him, and then made the latter believe that he was one with the operator, so that whatever affected him would also affect the subject. Then a third person, standing behind the operator, pricked some part of the latter, generally a part of his hand held behind his back. The

subject would then locate the spot where pain was felt in himself, and was correct even to a very narrow and definite limit. It seemed a wild guess to suppose that he formed his judgments from the small portions of the movements of the arms only of the third person, which were visible to him; and yet further experiment showed, that, if a screen were placed so that he could not see any of the movements of this third person, his ability to locate entirely disappeared. Experiments somewhat similar showed that the patient could tell what word the operator was writing, simply by the general movements of the arms of the latter.

Burgson himself calls attention to these experiments more as evidences of what he terms unconscious deception on the part of the hypnotized subject, than for other reasons. He calls attention, however, to the necessity of repeating those experiments of the English members of the Society of psychical research which seemed to point to mind-reading pure and simple. The average literary man who handles these latter facts does not seem to be aware of the great objection which holds against them scientifically. Absolutely the only way hitherto known of mental communication is the expression of an idea through physical media, and the retranslation of this back into a mental state. Mind-reading pure and simple does away with the intervening physical medium of expression. It is a fact of a different order from any now known. If it can be shown that what really takes place in these cases is cornea-reading, or some similar occurrence, the facts are reduced to those of the same order as ordinary mind-reading or muscle-reading, and they admit of a scientific explanation.

But these experiments also afford, as it seems to me, the most conclusive evidence yet offered of the law laid down by Helmholtz, that the existence of a sensation is always neglected in behalf of the meaning conveyed by it. Here the minute image on the cornea is perceived, not as what it is, but as a series of two or three figures which are definitely and correctly located in their proper spatial position. There is in these experiments no question of conscious deceit. The subject does not secretly and consciously perceive the image on the cornea, and then pass off the knowledge thus gained as if he had actually seen the figures. He himself is a victim of the deception. He thinks he sees them on the book. His sensations, in short, are mere signs or symbols, to which in themselves he pays no attention. He observes only the objective bearing, the information conveyed. The proof of the theory did not require such a crucial experiment as this, perhaps, and yet it is as striking an evidence as could be desired.

But it also shows that the interpretation of the sensation is governed by the conceptions already in consciousness, and this affords a valuable contribution to the growing theory of apperception. There is an increasing tendency among psychologists to regard all perceptions as judgments passed upon sensations by means of the conceptions present in the mind at the time of their occurrence. The sensation is interpreted into harmony with these dominant conceptions; so that we see not merely what is really there to see, but what the mind is adjusted to see, what it can read in out of itself. All hypnotism is one page of evidence to the influence of dominant conceptions, but the present instance is typical of the extent to which it may be carried. It is to be hoped that someone will carry the experiments further, and particularly see how far unsuspected cornea and muscle reading has entered into the as yet unexplained cases of mind-reading, so called.

J. D.

VOLUNTARY AMPUTATION AMONG CRAY-FISH.

IN referring to limb-shedding as a voluntary act among certain crustaceans, Professor Huxley tells us in his 'Crayfish' that "this voluntary amputation is always effected at the same place; namely, where the limb is slenderest, just beyond the articulation which unites the basal joint with the next. The other limbs also readily part at the joints; and it is very common to meet with crayfish which have undergone such mutilation." Quite recently (Sept. 4) M. H. de Varigny, in a very instructive paper which he has published in the *Revue scientifique*, entitled "L'amputation réflexe des pattes chez les crustacés," presents us with the results of a long series of experiments of his, undertaken with the view of throwing additional light upon this subject. M. Varigny studied the phenomenon in quite a variety of species and in several hundred individuals. He claims that in every instance the amputation is voluntary, and is truly an amputation, and not a disarticulation due to the feebleness of the inter-articular membrane of the joint. Much less is the throwing-off of the limb ever due to a fracture.

Then referring to the previous researches of M. Frédéricq, M. Varigny further claims that this act on the part of the crustacean will not only follow a direct blow, but may often be induced through either scratching or bruising the claw, or simply rubbing it, or through the action of the electric current. Moreover, it is found that the amputation is reflex, and depends upon the action of the central nervous system, for when the latter

is injured, or the animal brought under the influence of an anaesthetic, it cannot be performed; that when the amputation is voluntary, the crab loses but little blood, which is not the case when the Limb is removed by the experimenter, thus going to show that the act is purely a protective one, often saving the life of the animal with the minimum amount of injury.

The power to perform the act with promptness varies with the different species, and in any of them, when the animal is fatigued, it is not apt to resort to it. In experimenting with vigorous specimens of *Carcinus maenas*, it was observed that when the ten limbs were successively struck, allowing sufficient time for each one to detach itself before the next leg was struck, a far greater number were thrown off than when they were all struck together, or in very rapid succession.

Then, in one hundred and ten specimens of the same species, it was found that a second blow upon the undetached claws would cause them, in nearly all cases, to come away likewise, especially after the animal had somewhat recovered from the shock caused by the loss of its other limbs. And when the same experiments are undertaken in the case of only five of the limbs, the number that come away was proportionately much greater. Further, it was noted that the animal was more successful in getting rid of its great claws, or pincers, than it was with the ambulatory limbs.

To sum up, then, M. Varigny believes this reflex function of defence, as performed among crustaceans, consists in a voluntary amputation, indifferently executed among those species where in the musculature of the limbs is but feebly developed, and among individuals exhausted by severe pain, as in such cases where all the limbs have been simultaneously removed.

As the hemorrhage is so much less as resulting from the voluntary amputation, when compared with what takes place after the removal of the limb by artificial means, it will not be questioned but that this power as possessed by these animals is one of service to them.

Further investigations in this direction will be not only interesting, but valuable.

ELLIOTT'S ALASKA AND THE SEAL ISLANDS.

THIS handsomely illustrated and printed volume is evidently intended for a popular audience. Little of its contents is new. That which is original with the author, and due to his personal observation, is in great part a re-arrangement and amplification of matter printed by him two or

Our arctic province Alaska and the Seal Islands. By HENRY W. ELLIOTT. New York, Scribner, 1886. 8°.

three times previously, especially in the octavo report on the 'Condition of affairs in Alaska,' issued by the government in 1875, and in the quarto document of the census series of 1880, relating to the fur-seal fisheries and kindred topics, published in 1883, from which part of the illustrations of the present volume have been adapted or reduced. This, however, will not diminish the interest or value of the work for those who are not in the habit of consulting government documents, or who read merely for general information. The part of the work which is a re-arrangement of matter original with others is naturally less satisfactory than that on the Aleutian and Seal islands, where the author is at home in the scenes he, for the most part, very fairly and accurately describes. Many of the illustrations are faithful and good, especially those due to pen-and-ink sketches. From these, however, the human figure-pieces must be excepted: the faces in particular partake somewhat of caricature, are generally out of drawing, and have absolutely no anthropological value. The landscapes, excepting a few representing mountains, are generally very good. In the copy before us, Mount Shishaldin has disappeared from the plate which claims to give a glimpse of it (p. 146); Mount Iliamna is represented with a slope near the peak (p. 87) of about twenty-three degrees from the vertical; and Verstovia (p. 32) has hardly more than forty-five.

The book is to some extent a misnomer, the most interesting and available part of Alaska lying between latitudes 50° and 60° north, as does the greater part of the British Islands, which no one would think of calling arctic. The nomenclature and transliteration of Russian words are very irregular and often inaccurate, in no respect conforming to the systems generally adopted. Apart from the biology of the fur-seals and birds of the Seal Islands, the natural history of the book is very shaky, and the anthropology almost a minus quantity. But it is hardly worth while to lay much stress on its deficiencies from a scientific stand-point, since it is hardly likely to be consulted for precise data of that sort. Its historical errors are less numerous but more important. To give a single instance, the author repeats the error of Petroff in Bancroft's 'Alaska,' by stating that in 1868 Messrs. Hutchinson and Morgan passed the season in exclusive control of the sealing on St. George and St. Paul islands. As a matter of fact, there were five or more competing companies. There is an insufficient index; and the map, though well drawn and printed, in spite of the date, 1886, which it bears, is destitute of all the more important geographical discoveries of the last few years.

CHALLENGER REPORTS.

THE number of species collected by the Challenger in the group Marseniadae was but three, two of which, however, belong to a new genus. Dr. Rudolph Bergh, who is monographing this family, has not only given very full accounts of the anatomy of the species collected, but has added to them a general history of the nomenclature of the family, a list of the known genera and species, notes on their geographical distribution, and other matter of importance. He regards the group as most nearly related to the Velutinidae, and even suggests that a more thorough knowledge of both families may render it necessary to consolidate them.

The report on the Scaphopoda (tooth-shells) and Gasteropoda, by Rev. Robert Boog Watson, exhibits a stupendous amount of labor. It is accompanied by an appendix in which the Marquis de Folin reports on the Caecidae, a group of minute and interesting shells. The collection included some 1,300 recognizable species, new and old, with some 400 undeterminable fragments or worn specimens. Shore-collections furnished 86 species, of which 7 were new. Dredging-stations to 400 fathoms yielded 604 old species and 405 new ones. From forty-one stations between 2,650 and 400 fathoms, 89 known and 135 previously unknown species were obtained. The greatest depth at which any gastropod was secured was 2,650 fathoms, at station 325. Here a *Stilifer*, parasitic on some echinoderm, was obtained. *Basilissa*, *Dentalium*, and *Trochus* were found in 1,900 fathoms; *Dentalium*, *Cithna*, and various *Pleurotomas* were found in between 2,000 and 2,500 fathoms; and the large and interesting *Guivillea alabastrina* was dredged off the Crozets in 1,600 fathoms. *Oöcorys*, *Fusus*, *Cadulus*, *Seguenzia*, *Cylichna*, and *Actæon* are among the genera which presented themselves most frequently from the abysses. Leaving the shallow waters out of account, perhaps the richest haul of the voyage for the conchologists was that in 390 fathoms, off Culebra Island in the West Indies. This produced about 150 species, of which only about ten per cent were previously known to science. The average number of species of mollusks collected at a station was less than twelve. Mr. Watson's introduction is short. He lays stress on the importance to molluscan life of temperature; to a less degree, of depth; great differences in these respects operating as barriers against dispersion. He notes the importance of time in affording opportunities for distribution; so that species which

are found fossil and still exist, being presumably ancient, may be expected to occur over wide geographical areas. Where barriers of depth and temperature do not check distribution, the species tend to become universal, and in some cases have attained universal distribution. Finally, Mr. Watson affirms that even in the oldest and most widely distributed forms there is no trace of essential, lasting, and progressive change. This assertion may well be accepted, for it is precisely among such ancient and universally distributed forms that we should expect those evidences of inflexibility which have been recognized as characteristic of certain species by naturalists from Darwin down. It is the local and restricted species which should be studied for evidences of change. Where each pond has its form of *Limnaea*, and each tree its *Clausilia* or its *Achatinella*, there should evidences of change or adaptation be most easily recognized. Every one who has occasion to deal with deep-sea mollusks will find the learned, painstaking, voluminous, and profusely illustrated report of Mr. Watson an absolute necessity; and for other malacologists it will be, not a mine, but rather a warehouse of elaborated and systematized information.

The number of chitons collected by the expedition was small, as they are chiefly littoral in habit. There are reported on by Professor A. C. Haddon some thirty species of fifteen genera, of which seven were previously undescribed, and others, though described, had not been figured. The really deep-sea chitons all belong to the genus *Leptochiton*, and, judging by their sculpture, are nearly related forms. *Leptochiton Belknapii*, Dall, was dredged in over one thousand fathoms near the Aleutian Islands by the U.S.S. *Tuscarora*, and by the Challenger in about the same depth off the Philippine Islands. An allied species (*L. benthus*, Had.) was found in twenty-three hundred fathoms in the North Pacific, nine hundred miles north of the Sandwich Islands. It is so far the most abyssal chiton known. In all these cases the temperature was low, not exceeding 37° F. The genus, as one might expect, appears in shallower water toward the poles. Professor Haddon gives a synopsis of Carpenter's classification, and of the genera of *Leptoidea*. In his discussion of the species, he gives a valuable *résumé* of the status of the genera, and proves beyond question that the genus generally known as *Chitonellus* must be referred to *Cryptoplax*, Blainville, the various subdivisions resting upon insufficient or erroneous figures and observations. The plates to Professor Haddon's memoir are particularly excellent, and the paper marks a distinct step in advance in our knowledge of this very interesting group.

Report of the scientific results of the voyage of the Challenger during 1873-76. Vol. xv.: Zoölogy. London, Government, 1886. f.

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